

# **Spot Safety Project Evaluation**

Project Log # 200704317

Spot Safety Project # 04-95-234

## **Spot Safety Project Evaluation of the Traffic Signal and Left Turn Lane Installation at the Intersection of SR 1003 (Buffaloe Rd) and SR 1921 (Hospital Rd) City of Smithfield, Johnston County**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
Traffic Engineering and Safety Systems Branch  
North Carolina Department of Transportation

**Principal Investigator**

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Jason B. Schronce

8-2-2007  
Date

Traffic Safety Project Engineer

# ***Spot Safety Project Evaluation Documentation***

## **Subject Location**

Evaluation of Spot Safety Project Number 04-95-234 – The Intersection of SR 1003 (Buffaloe Rd) and SR 1921 (Hospital Rd) in Johnston County within the Smithfield City Limits.

## **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the installation of a 2-phase, actuated traffic signal and new left turn lanes on SR 1003. In the study period, SR 1003 (Buffaloe Rd) and SR 1921 (Hospital Rd) are both two-lane facilities with the speed limit increasing from 35 mph to 45 mph on SR 1003 and from 25 mph to 35 mph on SR 1921. The subject location is a crossroads type intersection, which was controlled by stop condition on the SR 1921 approaches.

The original statement of problem was the limited sight distance on eastbound Hospital Road created a dangerous situation for motorists entering the intersection from the side street. The intersection met signal warrants 1, 6, 9, and 11. The 1995 Highway Safety Improvement Program requested this site for review.

The initial crash analysis was completed from January 1, 1997 to December 31, 1999 with 31 reported crashes, 23 of which were deemed correctable Angle Collisions. These crashes produced one “A,” seven “B,” and eight “C” class injuries. The final completion date for the improvement at the subject intersection was on October 1, 2002 with a total cost of \$150,000.00.

## **Naive Before and After Analysis**

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from June 1, 2002 to January 31, 2003. The before period consisted of reported crashes from May 1, 1998 through May 31, 2002 (4 years and 1 month) and the after period consisted of reported crashes from February 1, 2003 through February 28, 2007 (4 years and 1 month). The ending date for this analysis was determined by the available crash data at the time of the analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

<b><u>Treatment Information</u></b>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	38	15	- 60.53 %
Total Severity Index	6.69	2.97	- 55.61 %
Target Crashes	31	8	- 74.19 %
Target Crash Severity Index	7.03	4.17	- 40.68 %
Volume	7,400	8,200	10.81 %
<b><u>Injury Crash Summary</u></b>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.00 %
Class B injury Crashes	6	1	- 83.33 %
Class C Injury Crashes	13	3	- 76.92 %
Total Injury Crashes	20	4	- 80.00 %

The naive before and after analysis at the treatment location resulted in a 60 percent decrease in Total Crashes, a 74 percent decrease in Target Crashes, and an 80 percent decrease in the number of Total Injury Crashes. The before period ADT year was 2000 and the after period ADT year was 2005.

## Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 60 percent decrease in Total Crashes and a 74 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the majority of crashes at the intersection in the before period (31 of 38) were the result of a vehicle improperly entering SR 1003 from Hospital Road. After the signal installation, this pattern was significantly reduced to only three (3) crashes, which were the result of a vehicle on SR 1003 running the red light. The only other pattern discovered in the after period was three (3) Left Turn, Same Roadway crashes which result from no protected signal phase.

There was a slight decrease in Rear-End Crashes at the intersection (from 3 to 2). The installation of the left turn lanes on SR 1003 enhanced these positive results.

The calculated benefit to cost ratio for this project is 7.62 considering total crashes. The benefit to cost ratio considering only target crashes is 7.48. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

**Location Map  
Johnston County  
Evaluation of Spot Safety Project # 04-95-234**



**Treatment Location: SR 1003 (Buffalo Rd) and SR 1921 (Hospital Rd) in Smithfield**

**TREATMENT SITE PHOTO TAKEN 7/25/2007**



Traveling South on SR 1003 (Buffaloe Rd)



Traveling North on SR 1003 (Buffaloe Rd)





Traveling East on SR 1921 (Hospital Road)



Traveling West on SR 1921 (Hospital Rd)

# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1003 at SR 1921  
COUNTY: Johnston  
FILE NO.: SS 04-95-234

BY: JBS  
DATE: 7/26/2007  
NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal, Left Turn Lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$150,000	10	0.149	\$22,354
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$150,000	10	0.149	\$22,354
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,400
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$25,654
TOTAL COST OF PROJECT=	\$150,000

## COMPREHENSIVE COST REDUCTION:

### ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.08	1	0.25	19	4.66	18	4.41	\$223,578
AFTER	4.08	0	0.00	4	0.98	11	2.70	\$28,162

Annual Benefits from Crash Cost Savings \$195,417

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$169,762

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 7.62

TOTAL COST OF PROJECT - \$150,000 COMPREHENSIVE B/C RATIO - 7.62



# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1003 at SR 1921  
COUNTY: Johnston  
FILE NO.: SS 04-95-234

BY: JBS  
DATE: 7/26/2007  
NOTES: Target Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal, Left Turn Lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$150,000	10	0.149	\$22,354
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$150,000	10	0.149	\$22,354
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,400
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$25,654
TOTAL COST OF PROJECT=	\$150,000

## COMPREHENSIVE COST REDUCTION:

### ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.08	1	0.25	15	3.68	15	3.68	\$203,064
AFTER	4.08	0	0.00	1	0.25	7	1.72	\$11,103

Annual Benefits from Crash Cost Savings \$191,961

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$166,306

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 7.48

TOTAL COST OF PROJECT - \$150,000 COMPREHENSIVE B/C RATIO - 7.48

SR 1003  
45 MPH

Smithfield  
Retirement  
Home

SR 1921  
35 MPH

### LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PAKED VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		FATALITY		50 MPH TO 59		ICY OR SNOW
	REAR END		SPEED UNKNOWN		60 MPH TO 69		ONLY
	RAN OFF ROAD				TO AND UP		

SS# 04-95-234  
Johnston County  
City of Smithfield  
Before Period  
5/1/98 - 5/31/02  
SR 1003 at SR 1921

SR 1921  
Hospital Road  
25 MPH

T-Mart  
Amaco

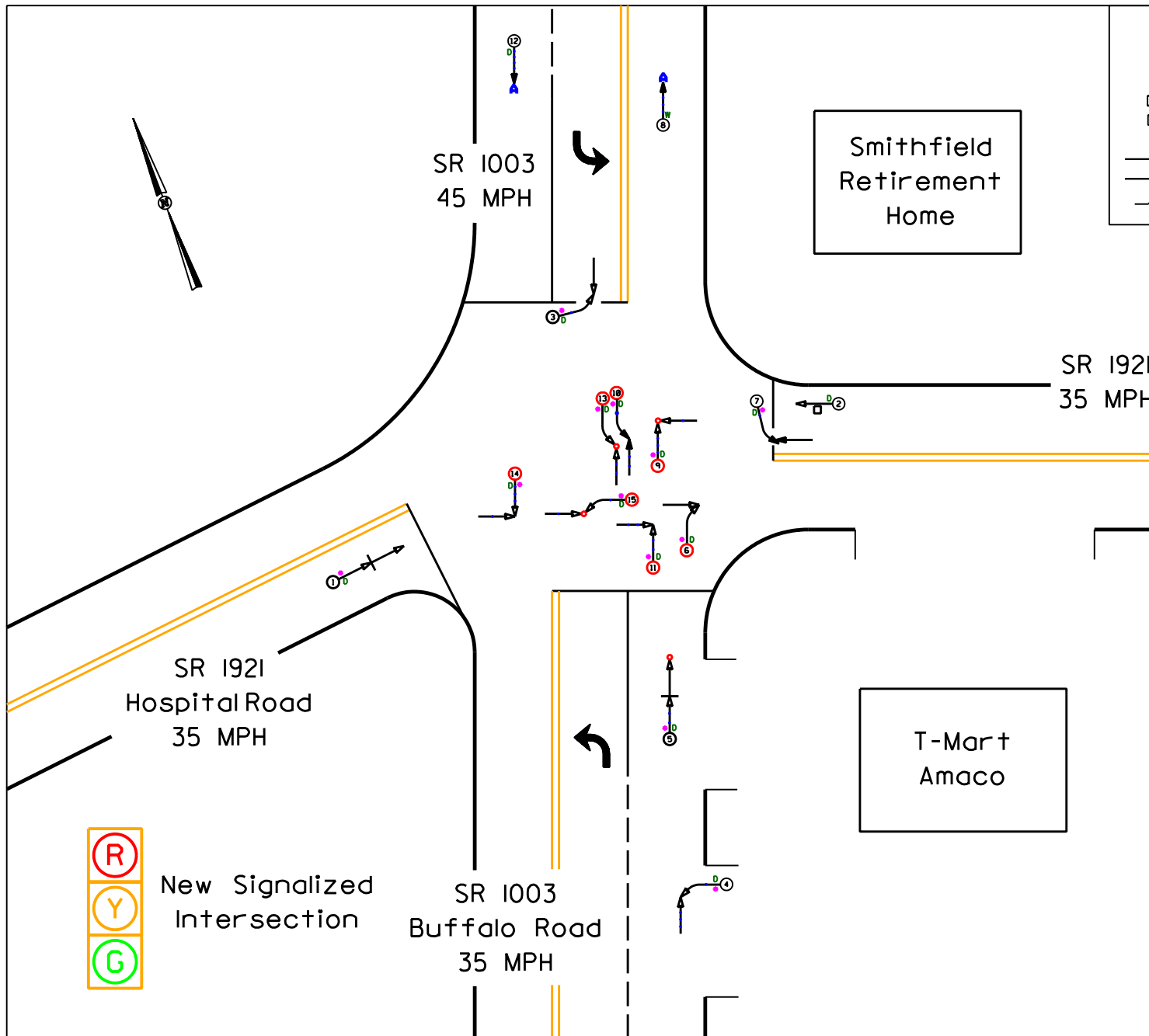
SR 1003  
Buffalo Road  
35 MPH

Target Crashes

### TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 5/1/1998 TO 5/31/2002	
DISTANCE: 1/4 MI. + 150 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: JBS	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-10-2007	
LOG NUMBER: SS# 04-95-234	

**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRAFFIC ENGINEERING AND SAFETY**  
**SYSTEMS BRANCH**



**LEGEND**

MOVING VEHICLE	ANGLE	9 MPH OR LESS	P PEDESTRIAN
PEDESTRIAN	TURNING	10 MPH TO 19	T TRAIN
PARKED VEHICLE	BACKING	20 MPH TO 29	D DRIVER AT FAULT
PARKING VEHICLE	SIDESWIP	30 MPH TO 39	D DRY
FIXED OBJECT	OUT OF CONTROL	40 MPH TO 49	W WET
HEAD ON	INJURY	50 MPH TO 59	I Icy or Snowy
REAR END	FATALITY	60 MPH TO 69	O ONLY
RAN OFF ROAD		TO AND UP	
		SPEED UNKNOWN	

SS# 04-95-234  
Johnston County  
City of Smithfield  
After Period  
2/1/03 - 2/28/07  
SR 1003 at SR 1921

Note Crash 2: A chair fell off a northbound right turning vehicle and struck vehicle as it sat at the signal

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

COLLISION DIAGRAM	
DIVISION: 4	AREA: 1
STUDY PERIOD: 2/1/2003 TO 2/28/2007	
DISTANCE: 1-1.0E + 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: JBS	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-10-2007	
LOG NUMBER: SS# 04-95-234	
<b>N.C. DEPARTMENT of TRANSPORTATION</b> <b>DIVISION of HIGHWAYS</b> <b>TRAFFIC ENGINEERING AND SAFETY</b> <b>SYSTEMS BRANCH</b>	

